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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
Mitsuo TAKASHIMA, et al.	: GROUP ART UNIT: 1793
SERIAL NO: 10/591,475	:
FILED: SEPTEMBER 1, 2006	: EXAMINER: SHEVIN, MARK L.
FOR: HIGH- STRENGTH BOLT SUPERIOR IN DELAYED FRACTURE RESISTANCE AND RELAXATION RESISTANCE	

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Appellants submit this brief in response to the Rejection dated June 4, 2010.

REAL PARTY IN INTEREST

The real parties in interest herein are Honda Motor Co., Ltd. of Tokyo, Japan; Saga Tekkohsho Co., Ltd. of Saga, Japan; and Kabushiki Kaisha Kobe Seiko Sho of Hyogo, Japan.

RELATED APPEALS AND INTERFERENCES

To the best of Appellants' knowledge, there are no appeals or interferences which will directly affect or be directly affected by, or have a bearing on, the Board's decision in this appeal.

STATUS OF CLAIMS

Claims 1-18 are rejected and on appeal. Claim 12 has been objected to.

STATUS OF AMENDMENTS

All amendments and remarks filed in this case have been entered and considered.

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1: The invention relates to a high-strength bolt having a tensile strength of 1,200 N/mm^2 or more that is superior in delayed fracture resistance and relaxation resistance, (Specification at page 3, par. [0009]),

wherein the bolt is prepared by: wire-drawing a bolt steel containing the following elements: C: 0.5 to 1.0% (mass %, the same shall apply hereinafter), Si: 1 to 3%, Mn: 0.2 to 2%, P: 0.03% or less (but not 0%), S: 0.03% or less (but not 0%), Al: 0.3% or less (but not 0%), and Cr: 0.51 to 2.5%, (Specification at page 3, par. [0009]; pages 4-5, par. [0015]; page 6, par. [0021]; page 10, par. [0034]),

and containing proeutectoid ferrite, proeutectoid cementite, bainite and martensite at a total areal rate of less than 20% and pearlite in balance; (Specification at page 3, par. [0009]);

cold-heading the wire into a bolt shape; (Specification at page 3, par. [0009]); and

then subjecting the bolt comprising 1% to 3% Si to a bluing treatment in a temperature range of 100 to 500°C to form a solid solution of Si in the ferrite. (Specification at page 3, par. [0009]; pages 8-9, par. [0030]).

Claim 15: The invention relates to a high-strength bolt having a tensile strength of at least 1,200 N/mm^2, (Specification at page 3, par. [0009]),

wherein the bolt is prepared by wire-drawing a bolt steel comprising: C: 0.5 to 1.0% by mass, Si: 1 to 3% by mass, Mn: 0.2 to 2% by mass, P: 0.03% or less by mass, S: 0.03% or less by mass, Al: 0.3% or less by mass, and Cr: 0.51 to 2.5% by mass, (Specification at page 3, par. [0009]; pages 4-5, par. [0015]; page 6, par. [0021]; and page 10, par. [0034]),

containing proeutectoid ferrite, proeutectoid cementite, bainite and martensite at a total areal rate of less than 20% and pearlite in balance; (Specification at page 3, par. [0009]);

cold-heading the wire into a bolt shape; (Specification at page 3, par. [0009]); and

then subjecting the bolt to a bluing treatment in a temperature range of 100 to 500°C to form a solid solution of Si in the ferrite. (Specification at page 3, par. [0009]; pages 8-9, par. [0030]).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether claims 1-18 are obvious under 35 U.S.C. § 103 over JP 2000-337334 ("Namimura") in view of any one of U.S. patent application publication no. 2002/0179207 ("Koike"), JP 59-226116 ("Hijkata") or U.S. patent 3,677,829 ("Stefayne").

ARGUMENT

The pending claims are not obvious over the applied art

The invention high-strength product is obtained by wire-drawing a bolt steel containing, among other ingredients, 1 to 3% Si, 0.51 to 2.5% Cr, proeutectoid ferrite, proeutectoid cementite, bainite and martensite at a total area rate of less than 20% and pearlite in balance; cold-heading the wire into a bolt shape; and then subjecting the bolt comprising 1 % to 3% Si to a bluing treatment in a temperature range of 100 to 500°C to form a solid solution of Si in the ferrite.

By subjecting the bolt containing 1-3% Si to the required bluing treatment, the relaxation resistance of the bolt is significantly improved (as compared to a bolt not subjected to the required bluing treatment containing 1.46% Si and/or a bolt subjected to the required bluing treating but containing less than 0.55% Si). (See, pars. [0045] and [0046], Table 4 and Fig. 4 of the present application). Thus, Si content and the required bluing treatments, together, are critical elements of the present invention which are neither taught nor suggested by the applied art.

Moreover, because the Si is solid-solubilized in the ferrite in the present application, the relaxation resistance of the required bluing treatment is enhanced. (See, pars. [0015] and [0030] of the present application). This is another critical element of the present invention which is neither taught nor suggested by the applied art.

Namimura does not teach or suggest this invention.

Namimura does not teach or suggest a bluing treatment. Because Namimura's bolt is not subjected to a bluing treatment, the relaxation resistance of the bolt is not improved (see discussion above of Table 4 and Fig. 4 of the present application for the example containing 1.46% Si). Thus, Namimura would not lead one of ordinary skill in the art to the present invention having the improved properties discussed above for at least the reason that it does not teach, suggest or recognize the importance of the required bluing treatments, particularly in combination with Si content.

Furthermore, Namimura teaches that pearlite area rate is preferably 100% (see, par. [0012]), meaning that ferrite area rate is preferably 0%. Thus, Namimura teaches that it is preferred that ferrite does not exist, meaning that the solid solution would preferably not form in the non-existent ferrite in Namimura. In other words, Namimura does not teach, suggest or recognize the importance or significance of forming the solid solution in the ferrite, meaning that Namimura cannot teach or suggest the present invention.

Namimura's teachings are further fatally deficient in that Namimura emphasizes the preference for low Si content of less than 1% (see, par. [0018]) which, combined with its failure to recognize the importance of the required bluing, means that Namimura leads to inferior bolts. (see discussion above and discussion of pars. [0045]-[0046] and Fig. 4 of the present application for the example containing 0.55% Si).

Further, Namimura teaches away from steel containing more than 0.5% Cr -- it teaches that Cr exceeding 0.5% reduces delayed fracture resistance and toughness. (See, par. [0020]). Thus, Namimura teaches away from the present invention requiring significant amounts of Cr.

For all of the above reasons, Namimura is fatally deficient -- it cannot teach or suggest the present invention.

The secondary references cannot compensate for Namimura's many fatal deficiencies.

Koike

Koike, at pars. [0025]-[0026], expressly limits Si content to 0.5%. In this regard, Koike explains that "the excessive Si content is likely to lower the ductility as well as the cold heatability of the steel wire," and then indicates that preferred Si content is 0.1% or 0.05%. (Par. [0026]). Furthermore, comparative example F in Koike contains 0.89% Si. Table 3 (test no. 8) indicates that this sample "cracked," and thus was unacceptable. The clear teaching of Koike was that Si content greater than 0.5% was unacceptable and should not be used, particularly when cold heading is performed. Stated another way, Koike actually teaches away from cold heading when Si content is greater than 0.5%. The combination of Namimura and Koike cannot yield the present invention.

Further, Namimura teaches warm forging. (See, par. [0007]). In fact, Namimura teaches away from cold-forging (it is difficult to form the bolt head by cold forging due to the high strength of the wire rod -- see, par. [0039]). In contrast, Koike is limited to cold forging (see, par. [0040]) and, in fact, teaches away from warm forging in par. [0021] by stating that warm forging detracts from strength of the product. Thus, these references are not properly combinable: that is, given Namimura's express limitation to warm forging, one of ordinary skill in the art would not have been motivated to modify Namimura's teachings related to warm forging using Koike's cold forging techniques. Stated another way, given that Namimura is directed to warm-forging, the combination of these references cannot lead to cold heading a product containing 1-3% Si and, thus, cannot lead to the present invention.

Also, Koike, like Namimura, teaches that an area rate of pearlite is preferably 100% (see, par. [0018]), meaning that ferrite preferably does not exist so that a solid solution of Si in the ferrite is not formed. Thus, the combination of the applied art would not lead one of ordinary skill in the art to the claimed invention in which the Si is solid-solubilized in the ferrite.

Also, Koike is fatally deficient because it teaches away from steel containing more than 0.5% Cr -- Koike teaches that Cr exceeding 0.5% does not further reduce proeutectoid cementite. (See, for example, pars. [0034]-[0035]). Thus, Koike would not motivate one of ordinary skill in the art to ignore Namimura's express teaching to use less than 0.5% Cr. In other words, the combination of applied references would not lead to a steel product having the required Cr content and, thus, cannot constitute the basis for a proper rejection given that one of the required elements is lacking from their combination.

For all of the above reasons the combination of Namimura and Koike cannot lead to the present invention.

Hijikata

Hijikata teaches a carbon content of 0.3-0.6 (see, Office Action at 6), and that higher carbon content causes a delayed fracture (see, page 3, left column, lines 15-20). Thus, Hajikata teaches away from carbon content above 0.6%. Because Namimura teaches that the preferred lower limit for carbon is 0.65% (see, par. [0016]), Namimura and Hijikata are not combinable. That is, the teachings, and products resulting from these two references, are directed to different types of steel having different carbon requirements and, thus, are not combinable.

Further, Hijikata discloses a bolt having a martensite inner structure and a pearlite surface layer (see, page 2, right column, lines 6-8). In stark contrast, Namimura teaches that in cross section of his bolt that the area rate of structures such as martensite is less than 20% and that of pearlite is 80% or more (see, pars. [0012] and [0045]). Thus, Namimura and Hijikata are not properly combinable for the further reason that they are directed to different types of products, having different structures. Teachings related to Hijikata's surface coated product teach or suggest nothing about Namimura's product, particularly in view of the difference in carbon content. One of ordinary skill in the art would not look to guidance from Hijikata's surface coated product regarding how to make Namimura's product.

For all of the above reasons the combination of Namimura and Hijikata cannot lead to the present invention.

Stefayne

The bluing treatment disclosed in Stefayne is completely different from the required bluing treatment. For example, the bluing temperature is controlled by contacting the steel product to organic vapors having a boiling point of 305-360°C for 30 minutes or less (see, col. 2, lines 35-46 and col. 3, lines 38-42).

Further, Stefayne is silent concerning steel composition. Thus, Stefayne teaches or suggests nothing about the required minimum amounts of Cr or Si, let alone of both Cr and Si. Also, Stefayne teaches or suggests nothing about the presence of ferrite, or the importance or significance of forming the solid solution in the ferrite. Thus, Stefayne cannot compensate for many of Namimura's fatal deficiencies (that is, the combination of Namimura and Stefayne cannot lead to a *prima facie* case of obviousness because several elements are lacking from the resulting combination).

So, even if Namimura's bolt is treated according to Stefayne's bluing treatment, the benefits of the present invention (including improved relaxation resistance) would not be obtained because, for example, the required bluing treatment would not be performed, the required Si content would not be present, the required Cr content would not be present and the required ferrite would not be present.

Accordingly, the combination of Namimura and Stefayne would not lead to the present invention.

Given the many identified deficiencies of the applied art, one of ordinary skill in the art would not have produced invention bolts having improved relaxation resistance properties. Instead, the art would be without such bolts. It is only because the present inventors went directly against the disclosures of the applied art that they were able to discover bolts having the improved relaxation resistance properties of the present invention.

In sum, the applied art would not have motivated one skilled in the art to arrive at the claimed invention requiring require the presence of (1) 0.51-2.5% Cr; <u>and</u> (2) at least 1% Si; <u>and</u> (3) the required bluing treatments; <u>and</u> (4) the required ferrite, but rather would have led one skilled in the art away from it. Under such circumstances, the claimed invention cannot be obvious.

Finally, Appellants intend to amend or delete claim 12 upon indication of allowable subject matter.

I. Conclusion

In view of the above remarks and reasons explaining the patentable distinctness of the presently appealed claims over the applied art, Appellants request that the Examiner's rejection be REVERSED.

Respectfully submitted,

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APPENDIX I (CLAIMS)

1. (Previously Presented): A high-strength bolt having a tensile strength of 1,200 N/mm^2 or more that is superior in delayed fracture resistance and relaxation resistance, wherein the bolt is prepared by: wire-drawing a bolt steel containing the following elements: C: 0.5 to 1.0% (mass %, the same shall apply hereinafter), Si: 1 to 3%, Mn: 0.2 to 2%, P: 0.03% or less (but not 0%), S: 0.03% or less (but not 0%), Al: 0.3% or less (but not 0%), and Cr: 0.51 to 2.5%, and containing proeutectoid ferrite, proeutectoid cementite, bainite and martensite at a total areal rate of less than 20% and pearlite in balance; cold-heading the wire into a bolt shape; and then subjecting the bolt comprising 1% to 3% Si to a bluing treatment in a temperature range of 100 to 500°C to form a solid solution of Si in the ferrite.

2. (Previously Presented): The high-strength bolt according to Claim 1, wherein the bolt steel further comprises Co in an amount of 0.5% or less (but not 0%).

3. (Original): The high-strength bolt according to Claim 1, wherein the bolt steel further comprises Ni at 1.0% or less (but not 0%).

4. (Original): The high-strength bolt according to Claim 1, wherein the bolt steel further comprises Cu at 1.0% or less (but not 0%).

5. (Original): The high-strength bolt according to Claim 1, wherein the bolt steel further comprises at least one element selected from Mo, V, Nb, Ti, and W in a total amount of 0.5% or less (but not 0%).

6. (Original): The high-strength bolt according to Claim 1, wherein the bolt steel further comprises B at 0.003% or less (but not 0%).

7. (Original): The high-strength bolt according to Claim 2, wherein the bolt steel further comprises Ni at 1.0% or less (but not 0%).

8. (Original): The high-strength bolt according to Claim 2, wherein the bolt steel further comprises at least one element selected from Mo, V, Nb, Ti, and W in a total amount of 0.5% or less (but not 0%).

9. (Original): The high-strength bolt according to Claim 2, wherein the bolt steel further comprises B at 0.003% or less (but not 0%).

10. (Original): The high-strength bolt according to Claim 7, wherein the bolt steel further comprises at least one element selected from Mo, V, Nb, Ti, and W in a total amount of 0.5% or less (but not 0%).

11. (Original): The high-strength bolt according to Claim 1, wherein the elements in balance are Fe and inevitable impurities.

12. (Previously Presented): The high-strength bolt according to Claim 1, wherein the bolt steel comprises Si in an amount of 1% to 3%.

13. (Previously Presented): The high-strength bolt according to Claim 1, wherein the temperature for the bluing treatment ranges from 200°C to 500°C.

14. (Previously Presented): The high-strength bolt according to Claim 1, wherein the bolt steel comprises Cr in an amount of 0.51% to 1.2%.

15. (Previously Presented): A high-strength bolt having a tensile strength of at least 1,200 N/mm^2, wherein the bolt is prepared by wire-drawing a bolt steel comprising: C: 0.5 to 1.0% by mass, Si: 1 to 3% by mass, Mn: 0.2 to 2% by mass, P: 0.03% or less by mass, S: 0.03% or less by mass, Al: 0.3% or less by mass, and Cr: 0.51 to 2.5% by mass, containing proeutectoid ferrite, proeutectoid cementite, bainite and martensite at a total areal rate of less than 20% and pearlite in balance; cold-heading the wire into a bolt shape; and then subjecting the bolt to a bluing treatment in a temperature range of 100 to 500°C to form a solid solution of Si in the ferrite.

16. (Previously Presented): The high-strength bolt according to Claim 15, wherein the bolt steel further comprises 0.5% or less by mass of Co.

17. (Previously Presented): The high-strength bolt according to Claim 15, wherein the bolt steel further comprises Ni at 1.0% or less by mass.

18. (Previously Presented): The high-strength bolt according to Claim 15, wherein the bolt steel further comprises Cu at 1.0% or less by mass.

APPENDIX II (EVIDENCE)

None.

APPENDIX III
(RELATED PROCEEDINGS APPENDIX)

None.